

AVIATION WEEK

MAY 23, 1949

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U. S. Navy's PANTHER

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Race War

No longer able to hide their enmity over air coach competition, railroad officials are discussing possibility of raising coach fare out of their own skins. "railroad" domestic traffic dropped from a wartime high of 65 billion revenue passenger miles in 1944 to about 24.4 billion in 1945 and in 1946 to the downright pitiful level also has slumped sharply, but there is comparatively little sentiment for change in fare-level and rates.

Great Northern Railway began with a newspaper advertisement attack on National Airlines' transcontinental flycoach service, which runs combination passenger-rail DC-4s (Aircraft Week, May 9). Now the Milwaukee Road has joined in, stating that its economy coach fares are 24 percent lower and its sleeping coach fares 79 percent lower than cheapest fares in "comp planes."

Probe Rumors

A N. Y. Daily News report of a "dramatic partial probe of government aircraft procurement policy" had the aircraft industry puzzled last week. It also aroused the alleged sponsor of the investigation, Sen. Milford E. Taft (D., Md.), chairman of the Senate Armed Services Committee. The newspaper report said Taft had "received preliminary data on which the probe will be based."

Tafts told AIRCRAFT WEEK that he has no plans whatever for an investigation that could possibly be resolved in hopes of sensationalism, and that he hopes no evidence for such an investigation will be brought forward "because I intensely dislike sensational investigation."

Tafts does plan a thorough study of the proposed TG-Group Air Force program before his war-relief report legislation authorizes it. The legislation has already passed the House. Tafts probe will include information on the cost of the program, its strategic importance, and, of course, procurement policy. There is one speculation that some disgruntled aircraft manufacturer may see it, however, as a spring board to put USAF and other aircraft firms in an unfavorable light in the public eye.

According to the Daily News story, the source of the aircraft "scandal" will be Sen. Meyer, ex-USAf Major Gen-

NEWS SIDELIGHTS

Transport Ferozcut

End of the Berlin blockade will not materially affect U. S. Air Force transport procurement. USAF is already far behind in its post-war transport requirements and will spend about a quarter-billion dollars for new transports out of its fiscal 1950 budget.

Big surprise will be the purchase of a dozen Convair C-99 transports for logistic support of the B-36 bomber group. Convair will also get another USAF order for Convair-Lear as a home-grown MAXIS transport in addition to purchase of 16 additional C-125 versions of the Convair-Lear to be used as transport trainers and two-engine transitional trainers for pilots.

Other slices of the military transport pie will go to Douglas for its C-124B, Boeing's C-97A and Fairchild's C-119B. Latest reports indicated that the Lockheed L-1049, canceled cargo version of the Constellation, was out of the current military picture.

and, now serving out a jail sentence for perjury, who still faces an income tax evasion indictment. If Meyer does "talk," it will be a new development since the Senate Committee on Expenditures in Executive Departments opened the Meyer case a year ago. Capitol Hill investigators have since carefully offered to obtain testimony for Meyer if he would "talk." While Meyer boasted of knowing enough to resist scandals which would make his own case look like peanuts, he has never penetrated their rifts any so close.

Carrier Battle

Admirals are waging a last ditch fight for the Navy's \$5,000-ton aircraft carrier, which the services with members of the Senate Appropriations Committee. Although the committee has not yet opened hearings on the 1950 fiscal year armed services budget, it already appears set to slash the \$41 million allowed by the House for the giant carrier project. Sen. Richard Russell (D., Ga.), one of the Navy's staunchest supporters on Capitol Hill, (in a member

of the Appropriations Committee, he approved \$9 million last year for launching construction), told AIRCRAFT WEEK:

"I suspect that we did not go as deeply into the matter at the time. We made a mistake. But I am now convinced that the most sensible thing to do is to eliminate funds for the one-ship study from what is needed for contract termination."

(Should the admiral's dove make any headway, two members of the committee are set to become much in the course of stepping it—Sen. Lister Hill (D., Ala.) and Sen. Harley Kilgore (D., W. Va.). Both got up high-sounding positions on the Senate Armed Services Committee to take low-sounding positions on the Appropriations Committee for the specific purpose of blocking the carrier. As members of the Armed Services Committee last year they lauded the one-ship study's national defense value discussed in executive sessions. Their became so marginal at the Navy's proposal that they decided to force personal payoffs to transfer to the Appropriations Committee, where they could, though their substantial weight in blocking funds for the supercarrier.

Air Mail Can?

A move is underway on Capitol Hill to reduce Post Office Department payments to carriers to reduce pressure for postal rate increases. Senate Post Office and Civil Service Committee has set up a subcommittee to investigate rates paid to airlines, railroads and steamship lines for carrying the mail. Headed by Sen. Matthew Neely (D., W. Va.), subcommittee includes Sen. Kenneth McKellar (D., Tenn.), Sen. J. Allen Tate (D., Ind.), Sen. Edward Tamm (R., Miss.) and Sen. John E. Rife (R., Miss.).

Sen. William Langer (R., N. Dak.), author of the resolution providing for the investigation, told AIRCRAFT WEEK that he has "a whole lot of evidence showing that airlines and railroads are being overpaid." He anticipated that action on legislation providing for postal rate increases will be postponed until the investigation has been completed. "We may find that excesses in the form of overpayment to transportation companies can be cut down in that it will not be necessary to have the postal rate increases for additional revenue," he commented.



XF-90 Newest USAF Transonic Fighter

Twin jet engines may eventually place 25,000-lb. plane in Mach 1 speed class.

By Robert McManus

Lockheed XF-90, third of the Air Force transonic delta-wing fighter prototypes (November 1977, May 7 and May 16) is a sophisticated supersonic speed plane with many features F-35 Shooting Star lacks.

Although it now incorporates many of the new research features required for high-speed flight, the completed airplane indicates considerable design components from its progenitor, beyond three years ago. These changes have resulted from the separate wind tunnel and flight research programs in the intervening years.

Power Problems.—The original XF-90 was designed at a time when maximum single-engine power was only about 4000 hp, and greater power could only be obtained by using more engines. As a result, the XF-90 means two Westinghouse J-34 WE-22 turbofans to get enough jet thrust to fly.

Although it now includes an internally clapped 3000 hp axial thrust each and detour two turbine stages, in contrast to the single turbine stage used in other U. S. fighters, the XF-90. The current engine is a light test installation only and two J-34 WE-22 engines are scheduled for installation later in the program.

Core weight of the XF-90 has increased steadily from an original estimate of 13,500 lb. to the current 25,000 lb., a 66 percent weight gain that includes a new record in the "clean growth" of aircraft weight through the engineering stage.

Air Flow Roadblock.—Major design problems were the efficient blending of the transonic air flow required for the two engines in the thin, super atmosphere. Each air inlet on the XF-90 handles as much as air both as bleed on the F-35. Greater number of design changes was made during the course of development of the two inlets to accommodate the quantity of air required, while still holding external drag to a minimum. The result is large, sharp edge, sharply bent which was completely new knowledge bleed ducts, indicating the need for bleed air growth on the XF-90 nose.

With the combined weight of the two engines (approx. 10,000 lb.) and the weight of the fuselage, the air inlets and dual tailpipes forced Lockheed designers to present this weight almost due to tail making in a horizontal rather than the vertical. The design team then turned to meet and other needs.

This Wing.—Major step forward in fighter design is the extremely thin wing

profile used on the XF-90. Maximum wing thickness is only 8 percent of wing chord, the thinnest wing used in any test the supersonic Bell X-1 aircraft. This narrow profile required extremely high-strength alloy steel spar construction, which is a major contributor to the weight growth of the airplane. Wing is swept back 15 degrees and uses a heavy main spar with a large tapered lifting at the leading edge to handle tension loads. Nose ribs are normal to the leading edge and main ribs are oriented only slightly from the fuselage reference plane.

Despite that thin wing and heavy structure, Lockheed was forced to use wing fuel capacity, both fore and aft of the main spar. Main fuel supply is located in the leading edge in honey-combed tanks (located within) the engine. This difficult location of fuel was made necessary by the design requirement that the engine have a 300-mile range. Fuel capacity on the XF-90 comes without top tanks, fuel stored in the main tank but the new plane still classifies as a "penetration fighter" rather than an interceptor. Fuel required for maximum ferry range is provided by two 220-gal. attachable fuel tanks at the extreme wing tips.

Round Tip.—Lockheed has preserved rounded tips on both wing and tail surfaces in contrast to the straight edges of the industry, which changed to square tips on high-speed aircraft during the war and has preserved that form in current designs. The XF-90 has no jet

interference problems with the swept horizontal surfaces mounted forward and well above the position of the jet exhaust.

Structural stability and controls ability is maintained by a dorsal fin that actually originates at the wings and continues the length of the leading edge to the vertical stabilizer. A heavy hinge is wrapped around the dorsal fin position, indicating that one still must aerodynamic problems in this region.

Heavy Aerodynamic.—Standard tactical equipment is added including a periscope and air-conditioned cockpit panel, cockpit seat and electronics equipment in nose-indicating instruments. Cockpit layout follows previous recommendations by the Joint Chiefs of Staff, Defense Committee. Special attention was paid to high-volume pushbutton and maintainable features in the design. Service version will carry 25 men cannot but will have alternate seats and arrangements.

Lockheed modified the familiar "free-fall body" research technique by dropping an steel and winged plastic model of the XF-90 from high altitude and measuring the rate of fall through smoke trails by radar and telemetry. The difference in this test proved an order to the drag of the can. Agency being tested.

The XF-90 is currently undergoing taxi and power plant tests at Lockheed Air Terminal, Burbank, Calif., in the hands of their test pilot "Tom" LaVar who will make the initial test flights at Marine Air Force Base, 60 miles away in the Mojave Desert, in the next few weeks.



Dual tailpipes, visible in left photo. Actual unusual handling of XF-90, observed at right by designer Johnson.



XF-90 Specs

Type	1000 lb thrust jet
Span	Transonic fighter
Length	Approx. 55 ft
Height	Approx. 15 ft
Gross weight	Approx. 25,000 lb
Maximum speed	Mach 3.00 (jet engine)
Design speed	Mach 1.8 (supersonic)
Chief designer	Glenn L. Kelly, Johnson
Chief test pilot	Arthur W. "Tom" LaVar

Senate Group Told Subsidy Is Harmful

The president of the largest critics of domestic airline and an executive of a small nonaligned carrier have agreed before the Senate Interstate and Foreign Commerce Committee that Federal mail subsidies are a "cost plus" basis a stifling management's creative.

But C. R. Smith, American Airlines president, and George L. Lewis, president of Coastal Air Lines, prescribed completely different cost for the industry.

Smith called for more stringent CAP guidelines and less competition, while Lewis—as well as another awarded jet exec, Raymond Norden, president of Salsburg & Western Airlines—opposed less regulation and more competition.

► Duplication Effort.—The American Airlines president and congressional opponents and airlines and depicting water speed traffic too thin and above the current increasingly into federal defense to the Government. He recommended:

► CAP regulation be extended to airplanes with a uniform set of rules for all who engage in the business.

► Temporary subsidies be called on new, state-owned.

► Unnecessary routes be eliminated through merger or a rethinking of mail subsidies for their operations.

Declaring that "need" must payments to domestic airlines increased \$10 million in 1975 over 1947. Smith observed: "The point is we want to have a new set of rules."

It is a block to legal merger, he said, once management is at writing themselves out of jobs as long as they can keep going on Government support. He endorsed arguments of "survival" and "subsidy" payments to carriers.

► More Competition Sought.—Henry H. Hertz, president of Smith's position on Government support. He highlighted it as a major competition for their nonaligned companies. They recommended elimination of subsidies for scheduled airlines and a free field for development of non-scheduled airlines through continued CAP regulation.

Henry's company last winter and two DC-10s for low fare coach type service between New York and Miami in competition with National Airlines and Eastern Air Lines. With the CAP crackdown on non-scheduled airlines, Southwest's recent success at its



LeDuc 010

French Air Show Reveals New Planes

Piloted ramjet-powered craft is most striking plane on display at Grand Palais in 10th Paris aircraft exhibit.

Following is the first full report in this country of the latest European planes as shown at the Paris Air Show. Another extensive exclusive report, featuring transport and lightplanes, will appear next week.

By Boyd France
(McGraw-Hill World News)

PARIS—A sleek "jetty-back" and a turboprop glider, backed by a flashy instrument of transport, lightplanes and helicopters representing the tomorrow of flight nations, highlighted the 10th Paris Air Show, held in the glass-domed Grand Palais.

Many of the projects which attracted the growing crowds at the previous Paris Air Show in 1946, revolved at different over Osh Field five years. But there wasn't many models to what as a man's appetite, this year the growing beauty was new. The panorama of aviation seemed to have gained for itself.

► **No Supersonic**—The glancing jet was faster than ever—outside of those still under various nations' secret wings—but they shared one characteristic: the latest machines had already made them obsolete. There were no more supersonic aircraft at Paris, but

nobody seemed to miss them.

The majority of aviation surrounding the show decided whether supersonic light jets would ever be an effective weapons against fast, high flying strategic bombers. On this they agreed: no lightness slower than sound could worry bombers anymore.

The Air Show was still expensive for anyone as a first thing to look at, and there were plenty of lines for the visitors to rail around and examine. ► **French State Show**—But this year the jet still held again—especially those of France, which easily stole its own show. The French aircraft industry almost surpassed itself with the size and variety of its display.

René LeDuc's 610 "jetty-back" "jetty-back" seemed the biggest star. Nobody had expected it to be ready to fly, but a little more than a week before the show opened, it made its first flight under power. With full at its bottom guns, it stayed aloft 21 min and topped 450 mph.

► **Flying Storage**—The 016 is just a flying storage with five engines. It is three times lighter than comparable turboprops, with a gross weight of 2.5 metric tons, one ton of which is fuel. Other dimensions: 72 ft. h. long, 13.5 ft. high, 24 ft. 4 in. span. Air flow meters estimate an level cruising speed at 475 mph, at 30,000 ft. it is 350 mph. Its level speed from the pilot after the first test flight, however, indicate that the ship is capable of doing nearly twice that.

Estimated rate of climb is 12,780 ft. min. Ceiling is 65,000 ft. and range is estimated to be 535 miles at 65,000 ft. and 135 miles at sea level. The 610 lands at 125 mph. So far the craft has been launched from a Langsdorf 161, but LeDuc is sufficiently reported to be considering fitting the 610 with retractable wheels for takeoff.

► **S.E. 240-A**—A half-scale wind tunnel model of SNCA do Sud-Est's S.E. 2410 was displayed prominently. Nine engines, placed one above the other, are staggered to save space. They are fed by an air intake in the top of the fuselage. No crew position is indicated, but the cockpit will be in the nose.

► **CMS R 15**—A French turboprop glider, the CMS R 15 was one of the most primitive ships at the Salon. The glider, with a tiny 80 lb. turboprop mounted on its back, takes off on its own and carries up 15,000 ft. before reaching its full.

The craft is a median customer wing monoplane with a V-tail and motorcycle landing gear. It is powered with Turbomec turboprop that has 175 lb. static thrust at takeoff. Top speed is sea level is 155 mph at 10,000 ft. top speed is 360 mph. Rate of climb at takeoff is 750 ft. min. The craft has a ceiling of 35,000 ft. and range of 150 miles.



CMS R 15



90 6000



NC 1071



90 512



• **SO 6000**—Eventually destined to be a jet trainer, the SO 6000, first of Ponnier jets, is powered by a Rolls Royce Nene. Powerplant develops 5900 lb. thrust at 12,140 rpm at takeoff, 5900 lb. thrust at 21,500 rpm at normal cruising speed. The craft carries a crew of two, has 10 lb. rpm, 14.57 ft. length, 11.64 ft. height. Total weight is 59 metric tons. • **NC 1071**—The short bodied NC 1071 powered by two Rolls Royce Nenes, is intended as a tandem bomber. The two Nenes deliver 4510 lb. thrust and the craft has top speed of 450 mph.

Span of the NC 1071 is 65.5 ft., length 34.4 ft., and approximate weight is 12 metric tons.

• **SO 8000**—The cambered metal fighter SO 8000, fully loaded, at 2800 ft., has a top speed of 490 mph. Rate of climb at sea level is 5000 ft./min. Range is 1800 miles.

Empty weight is 4.58 metric tons, gross weight is 6.11 metric tons.

• **SO M2**—A half scale model of the experimental SO M2, powered by a 1200 hp engine, was displayed prominently at the Salon. The swept back craft is estimated to be capable of reaching Mach 0.6, and carries 3500 lb. of fuel.

France has other jets on display, too. The M2 415 and the SO 6820 (Aviation Week, Apr. 4, 1949) helped to round out the country's showing.

• **Helicopter Show**—Helicopters were conspicuously absent from the French display. So far, none of the dozen odd prototypes has been really successful. The SE 310, a development of the Sikorsky, recently had a serious crack-up and is now being repaired. The latest SE 3000 transport helicopter, designed by the German Focke-Wulf, has made only a few timid, unimpressive hops. The pilot's twin rotor G11E is still being flight-tested.

France put on the most interesting, if not the most impressive show, but other nations were represented. Britain, Belgium, Holland, Switzerland, Czechoslovakia, Italy and the United States.

• **Look With Awe!**—This was the Air Show Secret the secret of the Grand Palais, just off the Champs Elysees, where it has been held since 1909. It spilled over onto the Esplanade des Invalides, across the river, where a large square was boarded off to serve as a landing field.

In east corner of the esplanade, a long horizontal, gun-black cylinder lay horizontally. It looked ugly and evil compared to the jets which flitted (jerkily) overhead. But as its end it had flames higher and faster than any of them.

One couldn't help but feel that perhaps the V-2 would have the last laugh, perhaps it, and not the flow jets, held the record of man's desire in its wingless heart.



Top to bottom: SO 8000, SE 3101, SE 3000, Beguet G11E

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HIGHER SPEED TRENDS may necessitate an overall instrument arrangement such as this. Large viewing screen would give indications similar to observation altimeter.

High-Speed Designs Need Simple Cockpits

Stepped-up demands imposed by increasingly faster craft are approaching limits of pilot's ability.

The Navy's Office of Naval Research and the Bureau of Aeronautics are continually striving to keep Naval aviation at the highest possible level of operational efficiency. Instrument aids for pilots have become extremely important as technical developments of aircraft advance. It is hoped that this article will illustrate the degree of the problem.

By Lt. Casio G. H. Hoover, USN*
"Submarine," according to Webster, is the point beyond which no more can be absorbed.

Cocurrently with the rapid advance of modern aircraft, this definition is becoming applicable to the pilot's in-

formation in combat flight. Above scenes are presented to display instruments, which might include standard artificial horizon (center) flanked by acquired indicators and

altimeter. Scenarios located on each side of screen would serve for flight controls. Horizontally as limit of pilot's vision showing the craft's geographical position.

quency, both mental and physical, for absorbing necessary information required for flight.

The present instrument panel is rapidly becoming cramped too cramped for the average pilot, in consequence. Unless a decided change is brought about, we will soon reach a point where it will be impossible for the man to fly under instrument conditions.

•**Evidence**—This is a condition where too much of a good thing is just as bad as too little. When flight on instruments takes legs, pilots must plan, plan, plan, leg, leg, leg, and so on, often means available to indicate but none of the craft in the air.

With the introduction of the two and four engine aircraft and the use of turbo, instrument flying was greatly facilitated. As the problem of flight became more advanced, more and more instruments were added to transmit information to the pilot. And today we have instruments which are

actually used in a check, against other instruments, and the old story of "head by the window."

•**Reaction Factors**—Instruments are a means of relaying information to a person through visual channels. There are too many instruments, the more is "dread" because of the great number of readings required to determine overall condition.

If the instrument is slow at detecting to interpret, the man is again overburdened trying to absorb the information relayed.

Instruments used today are an outgrowth of the rapid advance in the development of aircraft and engines. For example, at one time the only power requirement necessary to indicate was engine rpm, and this was displayed on the tachometer. However, with the development of supercharged engines it became necessary to add the manifold pressure gauge. Then, as jet or gas power conditions it is necessary to add and properly adjust by the power quadrant two gauges reading in two entirely different forms of indication.

With the advent of the turbojet, the standard pressure gauge no longer was required, but as it also required the turbojet temperature gauge which, when used in connection with the tachometer, gave the pilot an indication of thrust. The turbojet temperature gauge also gave the allowable limits of power very much in the same way as given by the manifold pressure gauge. In some of the larger aircraft, even brake horsepower and brake mean effective pressure are used to indicate the power being developed.

•**Threat Considered Basic**—In power at jet, large or small, these instruments are merely a means of indicating thrust to the pilot. It is apparent that what he is actually concerned with, then, is thrust and not with engineering details of how it is produced to him. Rather, he is concerned with whether or not it is accurate and if he is getting the desired amount of thrust for the condition into which he has placed his aircraft.

Why not, then, give the pilot an indication in units of thrust to answer his basic question, rather than force him to do mental arithmetic to find the answer?

Let us assume for the moment the overall problem of instrumentation, not only for flight in instrument weather but in any ordinary flight. Why are instruments necessary?

We might well say because it is impossible for a human to obtain visually accurately a space, accurate relative motion over the earth, judge altitude over the earth, and determine the engine condition, all at these points by visual or visual cues. It might be said that this is not quite true because in the days of early flight the tachometer and oil pressure gauge were the only instruments used.

•**Standardization Difficult**—Modern flying has become so complex that today's aircraft fly at great altitudes and within given limits of time between points to permit, in some altitude, equally scheduled flights. Because of the increased complexity of the engine used, more instrumentation is necessary to insure their proper operation.

With this increased complexity and the use of aircraft becoming more diversified, more and more instruments have been added and, today, there is a constant expansion as to which are the most important and which arrangement is best.

Perhaps the most important step to date in standardization is the attempt to standardize the arrangement of the basic flight instruments (engine, altitude, direction indicator, altitude, turn and bank).

Actually there are some 700 different arrangements which could be effected with these ten instruments. If these instruments were fully adequate, complete



VIEWING SCREEN could have been for altitude levels, but vertical movement showing altitude rate of ascent or descent. Actual use would be controlled by automatic pilot. On geographical altitude, data in center of large clock-type circle shows craft position. It did not show below center, craft would be flying off shore, ahead of schedule. Triangles indicate the "Fuel Remaining" (in miles) and "Miles to Base" both built at 1/2 inch position.

FA index (turns) counter-clockwise. MTR index (psi) clockwise for oil pressure, counter-clockwise for vacuum. Flare above index ones would be point of ascent. Example of indicator one 1/2 inch west end 400 m, then standard 600 m, and at northeast point index showed 600 m, fuel remaining, fuel reserve would be 200 m. At left of geographical indicator a probable wrong to replace the engine gauge at right it shows some form of control dial.

standardization would be possible because any source of information completely satisfactory to everyone, is quickly accepted.

Basic reasons why standardization has not been achieved is probably because each of these ten instruments must be integrated with the other under certain conditions of flight, and the question under consideration is which conditions are the most important.

Adding very important consideration which indicates that instruments on our present panels are inadequate, is the security for increased training in instrument flying and the constant rehearsal training necessary to maintain a high standard of efficiency.

•**No Radical Change Yet**—The same basic instruments are being used today as were in use ten years ago. There are some new ones, but the type of presentation is essentially the same. Reason for the extremely little change in types of instruments is undoubtedly due to the tremendous production demands which come about during the post war period.

An example of this is the use of the altimeter. Ability of aircraft to operate above 20,000 ft. made it imperative to add further instruments for basic high altitudes. The immediate demand made it necessary to produce instru-

ments with the necessary change in the shortest time. Obviously the answer was to add a third needle to indicate tens of thousands of feet.

It is true that the instrument does indicate altitude up to 30,000 ft. and in increments of 20 ft., but it is very difficult to read and, as fact, is often misread. There has been at least one case of a pilot who actually removed his oxygen mask at 20,000 ft., knowing and the altimeter in indicating 15,000 ft. Fortunately, he recovered in time to avoid crashing out.

These instruments are not made to be like the present instruments, but merely to indicate functionally that a definite change must be made if we are to continue to fly faster, under very difficult conditions, and maintain a regular and reliable schedule.

•**Example of Integration**—Present instrument selection are not fully answering the questions, but are going one of the elements which must be integrated in the pilot's mind with other sources of information.

For instance, the pilot asks "How fast am I going?" for perhaps one of these considerations. These are: (1) "Am I flying over a still condition?" (2) "Am I making good my own speed?" (3) "Am I flying

*Assistant Chief, Special Projects Branch, Naval Division, Office of Naval Research. Operations personnel benefits are the culture's will do not necessarily represent those of the Navy Department.

ing too hot?" (And, contemptuous) "To give the pilot the answer to each question, the indication must be clearly associated with the function being considered."

If he wants to know his speed in relation to time, he must also check his power and attitude.

If he is concerned with fuel consumption, he must check, this meter must be placed in the engine or power section and the clock.

If he is checking his speed with respect to time, he must integrate it with his navigation equipment and clock.

In some of these cases, does the instrument show what you want, give a direct answer to the question?

In most cases the lack of integration of information necessary to answer a pilot's basic question must be done by the brain. It becomes obvious why a pilot flying under instrument conditions becomes fatigued after a period of flying.

Pressure Drop Warning—On the present instrument panel there is much information relative to oil volume in the pilot's oil than in a warning.

Oil level tell provides an indication which alerts the pilot whether the engine is functioning properly. If oil drops, there is very little that the pilot can do other than to just looking for a place to land. The fuel pressure sensor is equipped with an emergency pump.

In either case the actual value of pressure is not necessary. A warning system that is working light indicating failure shows the trend toward critical before would be far more useful than the condition and after more rapid recognition by the pilot.

Temperature gauges can be replaced with thermocouple switches. In these cases the fuel has been used but the instrument will warn in advance. Again, a warning arrangement would be superior when an instrument is employed.

Type Confusion—All instruments in present day aircraft for pilot to answer for the particular system or function for each type of plane. In changing from one type to another, pilot must also be confused because they cannot remember which settings are correct for the particular kind they are flying.

A considerable step was made in the past few years to simplify this problem by marking certain types of the dial periphery in red, yellow and green. At a glance the pilot is able to tell whether or not the instrument is indicating a safe condition. Since such an indication is available, it seems appropriate to one have to indicate the actual quantity in pounds or degrees without any visible space in a very small panel.

Practical Approach—Let us consider practical uses of solving your problem with a few least producing adequate instruments.

First, why have instruments? For the same reason a blind man has a cane. The cane does not replace his sight but does point him in the right direction based on the sound and feel he obtains from tapping his stick.

When he meets a block he can feel a slight manual rumble or he must resort to other means to maintain his position in space.

These "other means" are found in a set of instruments indicating the many variables which, together, make up the response of the plane. Since there are all kinds of instruments, they must be integrated in the pilot's mind very much as the blind man must integrate the feelings of his cane.

Correct Picture—The object then, is to provide instrumentation leading to duplicate that which we see when flying under correct conditions, because that picture represents the best amount of information. If we are to gain the relative situation which a pilot enjoys when flying correct, then we must duplicate the mental aspects of the correct picture within the cockpit. Correctness comes from the difficulties involved in flying of instruments is the necessity of making a mental transition from normal visual cues to a series of symbolic cues found in present day instruments. If we were able to replace these symbols with a picture which like the one we get when flying correct, we could then simplify the instrument flying problem.

When we return to the relief exhibit the common sensory cues which we use in our day life. For example, we must look directly at our present day instruments to read them. In order very few situations as we enjoy our present day instrument. Actually this is one of the strongest cues for maintaining balance. The information is qualitative when put into by the peripheral vision and is more or less self-referential on the part of the human.

The horizon line should be presented to the pilot in such a manner which can be acted up by his peripheral vision, that is a line of sight and landscape projected across the entire instrument panel rather than a small horizon indicator centrally located. Normal visibility can then be maintained, relatively speaking, by the pilot's reflex action while his direct vision is concentrating on sensitive quantitative information.

Data Pilot Needs—On the basis of a psychological analysis based around a few determined facts, there are five sources of information from which no data which could be made available to the pilot—the Earth, the air, the engine, the pilot, and other aircraft.

It was further found that it is in the nature of the pilot want to make few data observations. These are Direction, altitude, time and distance and acceleration.

To insure adequate information for the pilot to make these determinations, it was found that the instruments must answer five distinct questions:

- Which control should be moved?
- In what direction should it be moved?
- When should the control be moved?
- At what rate should it be moved?
- How long should it be held?

If each question is answered by each of the four determinations, the other question answered by the pilot will be adequate.

Compensate Fuel In—This brings up a very important point which generally has been overlooked. We cannot tell instruments at individual times. We must consider them as part of a system definitely integrated and correlated with the controls.

In other words, we must not design a system as an indicator or any separate input, but we must have a series of instruments and feed them into an integrated form of presentation. This does not mean that we should not tell the information as we should have a series of smaller, each indicating one of these bits of information, but rather have a system of instruments which, when viewed by the pilot, give two distinct scenes easily received and readily understood.

For example, a pilot will ask, "Is this my engine down?" Then, he is making a determination for direction about the three out of his plane. This information should be received visually—thereby, that is, he should get an indication of his attitude in respect to the turn area at the same time that he receives information as to his attitude about the pitch and roll area.

This can be done by presenting the information on a single disc to rotate about all three axes. This pictorial display could then be projected to spin the cockpit. Such an instrument can be developed.

Attitude Representation—Another question which is related to the first one is "What is my attitude?" The answer can be presented to the pilot in such a manner as to direction by superimposing on the attitude indicator a series of attitude lines. In this manner, we can present attitude as being a high-low in the horizontal plane just as we picture direction in a high-low. Attitude is really a level which we maintain in flight. The rate of change of these attitude levels would give us the rate of climb or descent.

In indicating the direction about the vertical axis, a prominent point could be superimposed on the horizon line to be used as a steering point. Seen in this pictorial representation of data, then we are not concerned with the determination of whether the aircraft is going in the proper direction. The

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immediately if the pilot knows he has to go and the fuel gauges tell him that he has no angle supply to make that distance, there is no calculation required.

Another vital question is, "How is my engine doing?" The pilot cannot take the time to read five or six dials (each indicated differently) to answer this question. Engine gauges should be simplified by a minute for establishing the right engine condition.

Computers can be developed to effect the engine condition situation. A warning system could be supplied which would tell the pilot just only when engine trouble was starting but the recognition of the trouble.

The question of automatic failure is important and some level of standby is necessary. With an arrangement as contemplated in the general scheme of simplification, there will be single means to provide warning steady indications are required. One way to increase safety would be to provide a completely separate alternate power source for emergency. This should be a "stand-by" or any really high speed airplane.

With adequate instrumentation that one very important consideration is that of overriding the pilot. The instrument room should be closely integrated with an explicit attitude-controlled automatic pilot.

Aviation is definitely going to be operated on reliable automatic flight at high speed. Aircraft design for this has already been proven. What remains to be done is to develop the means to change to cope with human limitations. We can't get better weather, but at least we have better instruments.

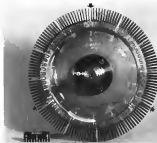
New Silicone Resin

Introduced to permit operation of high speed equipment at temperatures as high as 180 C, a new silicone resin is being made at General Electric Co. in White Plains, New York.

Offering general application in everything from glass and asbestos wire coatings and for bonding rods, wire pins and other metal components and transducers parts, the "silicone resin" is expected to have high dielectric strength and water resistance, strong track loss in less than 10 W at relatively low temperatures.

Canary given a tough flexible film and be close to mechanical properties at temperatures ranging up to 250 C.

The resin is sold currently at 60 percent and is more viscous at 200 centipoise at 25 C. It may be used as a replacement for standard petroleum greases or lubricants.



Cermet blades (green) mounted on a turbine wheel on indurated blade from metal blades except for a slight unevenness at the root.

Cermet: New Turbine Blade Alloy

Combination of ceramics and metals becomes a top contender in battle to find heat-resistant materials.

The mounting urgency for more heat-resistant materials for turbine blades has given rise to a battle between equal metal alloys and ceramics. Now it looks like the battle clearly may be won by neither one of these contenders—but by a material combining both.

The new material is, essentially, "it is probably the best ceramic-coated metal which other materials failed."

So promising is this new material that the American Society of Mechanical Engineers, and the 12th Wright Brothers Lecture.

"Research on materials may result in a more fruitful and rapid development of efficient materials than work on the metal itself." And of the latest industry requirements for high-powered aircraft gas turbine engines are to be met, rapid development of new materials may be required.

■ **More Heat, More Power**—Since the gas turbine is a heat engine, the greater the heat it generates the greater its power. The problem of heat generation is comparatively straight forward.

But the limitations on the amount of heat the engine can accommodate are usually outside its design gas turbine engines. If the maximum pressure is too high, the engine will be damaged by high temperature in excess of 2000 F. The heat engine will be damaged by high temperature in excess of 2000 F. The heat engine will be damaged by high temperature in excess of 2000 F.

■ **Thrust per pound of engine weight** could be increased 175 percent.

These remarkable gains are prohibited by the low heat resistance of the metal blade alloy.

■ **Inter-Cermet**—The research on metal alloys designed for high temperature service expanded, the difficulty of the problem became increasingly clear. An engineer suggested ceramics as a possible solution to the problem.

Current points to problems in simple heat resistance (up to 1800 F) but also early industrial power resistance in the metal shell, such as exposure to turbine blade during starting and stopping operations. To a large extent, thermal shock is present during these operations during flight.

■ **The Working-Score**—conventional metal turbine blades exhibit good thermal shock resistance, a combination of high heat resistance of ceramic and the good thermal shock resistance of metal alloys is a promising solution to the problem.

Actually, such composite materials are not new. Coated ceramic blades, for example, have been widely used for a number of years in the metal industry.

The good strength of metal heat-resistant alloys has been widely used for a number of years in the metal industry. The good strength of metal heat-resistant alloys has been widely used for a number of years in the metal industry. The good strength of metal heat-resistant alloys has been widely used for a number of years in the metal industry.

ing. And it is only in the past decade that highly improved methods of preparation of turbine blades and the fabrication of coated blades have been introduced in the United States.

■ **Cermet**—The first ceramic-coated turbine blades for gas turbine applications actually was conducted in Germany by R. Schindler and it is only in the past few months that extensive research has been conducted in the U.S.

One of the most promising materials is a cermet-type, consisting of 30 percent titanium nitride and 70 percent nickel.

This material has a relatively high thermal conductivity (20-30 Btu/in²/ft²/deg F), a low thermal expansion (5.5 x 10⁻⁶ in./in./deg F) and a modulus of elasticity of 55 million lb./sq. in. and good tensile strength, from which the thermal shock resistance was concluded to be adequate for turbine blades.

■ **Hot Transfer**—The high thermal conductivity of this cermet enables it to transfer heat to the turbine wheel as rapidly as a turbine blade of the metal transfer actually has run cooler than a heat-treated metal alloy blade on the same day.

High thermal conductivities are desirable for blades that are to be cooled because heat in the blade trailing edge where it is hard to provide cooling passages, can be conducted to the center of the blade. Another important property of cermet is that it has low specific gravity. It enables turbine blades weight to be reduced from about 100 lb. to 70 lb. for a 30 in. diameter blade.

■ **Shock Resistance**—It appeared that the new material possessed all of the desirable characteristics for a turbine blade. But left the question of thermal shock resistance. An investigation was conducted at the NASA Lewis laboratory to determine

■ **Resistance to thermal shock**—The new material showed good resistance to thermal shock at elevated temperatures.

■ **Performance characteristics**—under simulated engine conditions.

The specimens for the thermal shock resistance consisted of an electric furnace, employing a furnace, which has been kept the specimens and as an accompanying system to cool it. Specimens were inspected for internal and external flaws by ultrasonic and fluorescent methods, respectively.

■ **The Test**—A specimen was placed in the preheated furnace for 16 min. after which it was removed to the quenching tank within 1/4 in. and kept there for 1 min. The specimen was then placed in the air stream that the furnace was preheated to the flow of air.

■ **The specimen** was quenched at 50 F below the rate of 50 F per sec.

through a 6-in. diameter pipe with a velocity of approximately 50 ft/sec. The tests indicated that the specimens burst the specimen at the rate of 140 F per sec to 1800 F, and cooled it at the rate of 200 F per sec. This heating and cooling operation constituted one cycle and the cycle was immediately repeated.

A specimen was subjected to 25 of these cycles with a furnace temperature of 1800 F. If it survived this treatment, 25 cycles were successively repeated with furnace temperatures of 2000, 2200 and 2400 F, or until failure occurred. The appearance of a crack was considered a failure.

The cermet-coated turbine test was performed on a small gas turbine with hot gases supplied from a turbine combustion chamber. Three cermet blades were installed at equal intervals about the disk and the remaining 179 blades were fitted with metal blades obtained from the U.S. Air Force.

The turbine was run for 25 hours to about 6000 rpm and held there for five minutes to insure safety. The test was then started and test conditions obtained in approximately three minutes. The wheel was then operated at required conditions until a blade failure occurred, which was indicated by a change in pitch of the wheel.

A fragment of the wheel was removed for post-mortem inspection of the blades. The blades were examined for internal and external flaws by ultrasonic and fluorescent methods, respectively.

■ **Results**—These seven tests indicated the better properties of cermet. The short-term resistance to thermal shock was the lowest. The strength of 35,000 lb./sq. in. based upon the average hot-temperature strength. The best results were obtained with an average value of about 35,000 lb./sq. in.

■ **Thermal shock resistance**—The cermet blades showed a decrease in strength of 15,000 lb./sq. in. This is little more than about half of the extremely high tensile strength with which it compares favorably. But it can be considered good since the temperature gradient in the leading portion of metal alloy.

The cermet showed 25 cycles of the thermal shock resistance at 2400 F, whereas a metal alloy, subjected to heating plus thermal shock, specimens survived one cycle at 1800 F.

A turbine engine specimen was run in order to provide a comparison of the turbine engine conditions.

The test engine proved to be resistant to thermal shock, running 14 cycles at 2400 F in one test and 21 cycles at the same temperature in a second test. The specimens in a second test were preheated to the flow of air.

But it is the results of the cermet blades that are of greatest interest.

At the end of 12 hr. 15 min. of running the turbine, at speeds varying from 10,000 to 13,000 rpm and at 2500 F, a total of 100 metal blades had been replaced.

Only at this point did the first cermet blade fail due to test conditions.

■ **Blade With Case**—During the course of the repeated shut-downs of the turbine for metal blade replacement, one of the cermet blades was accidentally broken and a second inspection of the blade revealed failure.

Neither of these incidents reflected upon the ability of the material to survive the test conditions. They did indicate, however, that the material was as good as the handling of blades made of cermet-type cermet, thus a maximum of metal alloy blades.

During operation a close scrutiny of two cermet blades shown on the cermet blades. The outer layer was made of titanium dioxide (nickel-free which titanium is extracted). The inner layer is composed mostly of metal blades.

No significant change occurred in the base material, an important test result in the light of plane manufacturing with temperature change of some cermet.

Of the benefit of this series of tests, the main conclusion was not considered important since the scale was too small and needed to measure the mechanical shape of the blade and to make any making techniques. The more severe operating conditions against cermet might be required if the metal-forming cermet coating is not sufficiently positive.

■ **Conclusion**—The cermet blades of cermet-coated turbine gas turbine blades are:

■ **Longer life** at the currently used gas temperatures of 1800 to 1850 F.

■ **Short-term resistance** to thermal shock at 2400 F.

The new cermet-coated cermet has successfully proved its first success test of cermet gas turbine blades. Because properties of this material are known to be substantially better than the metal alloys and cermet alloys, the cermet-coated cermet has a high chance of being used in the future.

If cermet can reach these goals in the next few months, the cermet gas turbine engine may be a reality in the current engine (in heat-resistant materials).

Reference

Robert C. Allen, A. A. Allen, and R. C. Allen, "Cermet-coated turbine blades," *Aviation Week and Space News*, March 23, 1969, p. 28. (Cermet-coated turbine blades for use in gas turbine engines.)

West Coast Is Procurement Key

Los Angeles office handles 60 percent of Air Force procurement; current total is \$335 million.

By Alexander McIsaac

LOS ANGELES—Key to success of the USAF procurement program is the sprawling, interlocking web of Los Angeles. That makes the Los Angeles procurement field office (LAFPO) of Air Materiel Command second only to AMC headquarters in Dayton, Ohio, in the overall Air Force procurement picture. Here's why:

- Approximately 60 percent of all USAF procurement contracts on an interim basis administered by LAFPO.
- As of May 16, current contracts handled by LAFPO totaled approximately \$335 million, and numbered about 400.
- There are approximately 400 manufacturers on the seven-state LAFPO area (California, Oregon, Washington, Idaho, Utah, Nevada, Arizona) who are qualified sources for USAF procurement.

From 1949 to 1946 LAFPO was designated the western procurement district office of the old Air Materiel Command, and as such had complete authority for purchase to expedite production operations. (In the event of an office emergency it is likely that this system again would be followed.)

A brief study of the procurement facilities at Los Angeles shows Army Materiel Command, Air Materiel Command, and Air Force contracts are sought into how they can use the industry services offered by this or any of the six other AMC procurement field offices (at Boston, Chicago, Detroit, Ft. Worth, New York and Dayton).

- **Organization.** Chief—Administering procurement that shows how the Los Angeles office is not unique, a branch which is basically similar to the organization of the other six.

Office most closely concerned with the run of the mill USAF supplier is the technical, inspection, and industrial planning and production sections. If the contractor makes an airplane or remanufactures a plane under USAF contract, he also is concerned with the flight operations section.

- **New Business.** Industrial planning section handles the "new business" department of the field office. This includes posting orders of requirements for bids and contract award decisions, and

monitoring new manufacturers as quickly as USAF sources. Copies of bid notices are available in the field office for the would-be bidders. They can obtain bid kits, if they decide to offer bids, from contracting officer, AMC, Wright Patterson AFB, Dayton, Ohio, after telephoning MCFPNT1. But if a manufacturer bids for a bid it is expected to make a bid.

Before the manufacturer offers a bid, he is expected to qualify himself in a store like the industrial district which he wishes to make. Particular planning of costs makes the preliminary survey of his facilities which is required for qualification, it is required.

- **After Qualifying.** Once he has qualified as an approved supplier and has obtained a contract, his dealings thereafter are principally with the contract and inspection sections, and with the security branch if he is making any kind of a classified item. The positive control branch works with him, in some that he is on schedule and is accurate, any production bottlenecks which might prevent adherence to schedule.

Coordinating efforts at LAFPO are in a state of about one office to every 100 active contractors in the area. They oversee the carrying out of each contract to completion or termination, in general contracts are awarded to manufacturers, and, most important of all, they make payment.

- **Payment Methods.** Payments are made in several different ways, depending on terms of the contract. In some cases they are made in office at several times a day, on fixed-price contracts. Contractor-office relationships are often complicated by the fact that the contractor has several different contracts active at the same time, including perhaps some prime contracts and some subcontracts.

Clamped with detailed budget items of money, the contracting officers have a very responsible job. As one of them put it, he is not just a bill collector. "The division of Atlanta is in the back of every contracting officer's mind."

- **Plant Inspection.** Inspection of LAFPO plants requires approximately 250 government employees in the LAFPO area (about half of the total LAFPO organization), in addition to manufacturers'

inspectors. Ratio of Air Force to contractor inspectors varies from about 1 to 10 to 1 to 20, after a plant inspection system has been shaken down to a satisfactory operating condition. In addition to the resident inspection groups at the major aircraft plants in the Los Angeles area, resident inspectors are stationed at approximately twelve other large plants which are important suppliers of Air Force equipment. Problem of training new inspectors currently is not so serious as it once was due to the large number of trained persons presently capable of inspection work available since World War II.

Inspection personnel are an integral part of the manufacturing process. It becomes most complicated when severe inspection is required on custom manufactured items which are consequently of assemblies and which are not standard components to inspect at the receiving plant.

- **Policy.** Los Angeles 49 such items are listed on an AMC policy list including such things as hydraulic control, aircraft actuators, electronic equipment, fuel injection parts, control pulleys, radiator inter-coolers, etc. When a purchase order is issued, contractor may request severe inspection at subcontractor's plant and request is then passed on by plant representative.

Prime contractors are held liable for performance of their subcontractors, but the USAF inspection system is ready to follow up on trouble shooting in any supplier's plant.

Experience has shown that a thorough plant check at the beginning, and an annual inspection during each plant based on a money by an AMC headquarters team, which may of the delivered. Unless the plant inspection team is satisfied in a survey of the delivered status and is recommended as a "good."

- **Control Check.** An inspection team must maintain a control check on materials and personnel, and book orders work with the manufacturer in preparing materials, delivered orders, etc., in the interest of standardization.

Problem of maintaining security in plants where classified items are being produced does not always involve an elaborate or costly guard setup. In at least one small plant in the Los Angeles area, security requirements are satisfied by one day-shift guard and one night guard.

The day-shift guard must register and submit submitted status. A locked facility, supervised by the guard station agreement for the control of access.

In event a manufacturer is making an item which is classified it will be seen why the LAFPO office of special in-

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inspections to make a strictly check on plant officers and employees directly concerned with the project. This involves a personnel security questionnaire form.

A flight inspection technique at LAFPO involves inspection flights on test planes in the area and subsequent qualifications of flight personnel. Experience USAF pilots are assigned to the area, including several officers who devote in other administrative jobs.

- **Acceptance Tests.** In addition to the testing of the latest new production airplanes, the flight operations pilots are also responsible for the acceptance tests on C-47, C-54, and C-46 which are being converted for

USAF use at Air Force Materiel Command, Van Nuys, Lockheed, Aerojet, Boeing, Corp., Burbank, General Electric & Maintenance Corp., Glendale, and Good Central Airport, Glendale.

The other six makes investigations at LAFPO plants available in the area, and operates contractor training programs which have been set up for the other civilian test pilots.

Major AFB, though in the LAFPO area, has its own bid pilot status, independent of the LAFPO office. Occasionally, however, civilian pilots may call upon the other for additional pilots if they are needed for some special test project.

Aircraft Earnings

Twenty-five leading aircraft and parts manufacturing companies reported \$17,710,000 net profit also from May 1946, compared to a \$15,250,000 net profit in 1947, according to a survey in National City Bank, New York.

The 1948 aircraft industry reported a 33 percent increase in net assets and a 1.4 percent profit margin on sales. By contrast, a study of 3162 U.S. corporations in all lines of business showed a 14 percent increase in net assets and a 7.1 percent profit margin on sales last year.

PRODUCTION BRIEFING

• **Boeing Airplane Co.** Wichita plant has the first production model B-47 Strategic bomber on the job. Strakes are subcontracting firms are expected to start B-47 production shortly. Boeing Wichita employment is now at 2000.

• **Coverall's San Diego division** will take up part of its recent unemployment slide, with a subcontracting program on the B-10 program. San Diego producer-worker employment has dropped 2000 in recent months as the Coverall-Lester program tapered off. Most of the recently laid-off construction workers are

He received no other B-16 bomb runs and killed and wounded some others.

► **TEMCO** (Terra Engineering & Mfg. Co.) has developed two new, cost-effective kits for the TEMCO® built personal pits. The kits are being produced by TEMCO for installation as optional equipment on new Swifts and will be available shortly in package form for field installation on Swifts now in use.

■ **Canadian Ltd.**, Montreal, has selected the first of four Canadian firms to submit to Canadian Pacific Airports a proposal to build a new 120,000-sq-ft airport terminal, two months ahead of schedule. The CPA reason has a pre-engineered cabin and facilities for construction to a design on the trans-Pacific route, which is scheduled to begin in 1994.

► **Thursdays Standard** division of United Aircraft Corp. has delivered about 90 in total for 100 propellers for Canadian Air installations on the Canadian Four-bomb bomber for British Overseas Airways and Canadian Pacific Airlines. The Canadian Four will use a 15-ft diameter three-bladed, Hydromatic propeller with reversible pitch.

► **Berline Industries Inc.**, Cleveland, has been awarded a contract to develop a mental work aid for finalizing of jet engine parts, principally turbine blades. The new firm is owned by John J. Amatore Jr. and E. E. Slabe and will be located in a plant addition now being built in the Slabe Machine Products Co. ► **Twiss Coach Co.**, Buffalo, plans to complete a new plant for manufacturing

what COLONIAL likes about
EDISON FIRE DETECTION



MR F R CLARKE,
Manufacturing Engineer,
Lubrizol Industries, Inc.,
Akron, Ohio 44316, USA.
Device is a panel mounted
circuit in a shielded metal
can, 100 mm long.

¹⁸ "... have never had a false alarm in flight..."

Surgeon Mr. F. R. Crowl, Maintenance Engineer of Colonial Airline, Inc., whom we recently asked what he considered important features of the Latham Fire Detection System used throughout Colonial's DC-4 airplanes.

1 "A path learner checks the entire system.

2 The thermocouple wires are copper, tinned and cut to install.

1. Central panel design features tend to simplify installation.⁶

"We endorse," concludes Mr. Casal, "to have the best available type of protection for our customers in consummate our unswerving safety record."

Edison Free Detection is used on the major U.S. airlines, and is approved by the U.S. Department of Justice, as well as numerous other government and law enforcement agencies.



⁸Cops of the Cleveland Police said he gladly went along with

EDISON
FIRE DETECTION

INSTRUMENT DIVISION
Thomas A. Salzman, Manager
100 Lehigh Avenue
West Orange, NJ 07063

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aircraft parts on subcontracts from German Republic and Franchised from Czech employment is now, at 1978 with about 100 additional workers needed.

► **Dub Aircraft Corp.**, of Houston, Ore., approved merger of the firm with General Dynamics Ltd. and changed its name to **Transwest Airlines Ltd.** The firm will concentrate on sales and electronic manufacturing.

► Minneapolis: Honeywell Regulator Co. will repair assets of the H. B. Finch Co. Philadelphia, makers of water valves.

• **Fido Cargo** has moved on relief for 14 sets of Model 3070 scrapers, sent from Costa Aéreojet Co. to be delivered to the U. S. Air Force for installation on the Costa LC-117A utility transport to be used in African areas, once here.

WHO'S WHERE

Air Associates Inc., Teterboro, N.J., appointed Fred A. Timoney manager of the branch located at Grand Central Airport, Glendale, Calif. Timoney formerly was employed for five years by Lockheed Aircraft Corp., and he has been by Pacific Aerospace Corp., John F. Monahan, branch district department manager for company, has been promoted to assistant branch manager.

National Aircraft Standards Committee named S. D. Dorsch secretary, a flight Marshall Area who agreed to accept a problem with the Mission Board Aircraft committee. Dorsch formerly was Deputy Standards Coordinator of Civil Aeronautics Administration.

Sender Aviation Corp. appoints Howard K. Morgan director of engineering for a new division at Kansas City, Mo., engaged in special work for the Atomic Energy Commission. Morgan was director of engineering of the radio division in Baltimore.

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CHAMPION

America's Favorite Spark Plug



HERITAGE

Champion Ceramic Aircraft Spark Plugs are not only products of specialization, but also beneficiaries of the richest heritage in the spark plug field. Champion produces spark plugs exclusively and has attained leadership because

every single Champion Spark Plug—aircraft, automotive or otherwise—is backed by unequalled research, engineering, manufacturing facilities and EXPERIENCE THAT HAS NO EQUAL. Champion Spark Plug Company, Toledo 1, Ohio.

**USE CHAMPIONS
AND FLY WITH CONFIDENCE**

Why Are More and More Aircraft Manufacturers and Operators Switching to Fenwal Fire and Over-Heat Detectors?

Units are
hermetically
sealed... weigh
only 2 ounces each.
Repeatable.

1. Complies with CAA Technical Standard Order C-11 in accordance with Society of Automotive Engineers Specifications AS-61.
2. Proven reliability.
3. Simple, low-cost installation.
4. No maintenance problem.

Further information
on request

FENWAL,
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77 Pleasant Street
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Fenwal
THERMOSWITCH
New 2-1/2" dia.
Aircraft Fire
and Over-Heat Detectors
SENSITIVE... but only to heat



Checks Torque Tools

Represented in a meeting done for assembly checking tightening capacity, range and adjustment of power and torque tools. "Torque-wrench" developed by Blackmont, Inc., 2516 E. 110th St., Los Angeles 25, Calif., is designed to eliminate variations in accuracy, bolts, nuts, and screws. On one point, maximum torque power-delivering capacity of impact (battery or air-driven), torque required to reach certain torque, and ultimate torque capacity of tool. Device also reads rpm from kinetic energy tools which deliver ultimate torque with first cycle and later amounts on subsequent cycles. It will demonstrate on direct drives, torque at which clutch releases and at what rate torque increases is accomplished beyond releasing point when clutch is held into engagement. Master torque wrench is furnished with such unit so that as torque of analyzer can be checked satisfactorily. Unit requires no power connection and is mounted on a portable stand. It weighs 155 lb. standard. Overall dimensions are: Height, 5 ft 6 in.; length, 2 ft 2 in.; width, 1 ft. 8 in.

Welds At High Speed

Electrode, No. 103, offered by Robert Bros. Co., Troy, Ohio, is designed for making thin, intermittent welds at high speed on all types of steel in any position, using either a c or d c, straight or reverse polarity. It is represented to have fast-opening characteristics together with limited spool type so which can be started easily and returned without searing or hitting electrode against work. Claim is that welds made by this type electrode to work to permit being welded at high speed. Unit is available in 12, 14-in. lengths.

AVIATION WORLD NEWS

Indian Airlines Have Tough Spring

Two carriers collapsed; largest domestic operator hit by strike; pilot shortage still a big problem.

BOMBAY—It's been a tough spring for the Indian airlines. Two have collapsed and are being liquidated—Kapoor, based at Madras, and Air India, based at Bombay. The country's largest domestic operator, Air India, has been hit by a strike at its main base here ending operations for weeks.

The two failures have added impetus to the studies the Air Transport Licensing Board is making of applications for long-term franchises. They expect the government's decision to keep potential competitors out of international air flying.

► **No Merges Yet**—Although the ATLB announced some time ago that it will launch a bidding war to curb existing rivalry competition to date there have been no mergers announced. The applications are due for consideration during the March-May period.

All the seven lines now operating have applied for long franchises, in many cases for routes not now served. The seven, with their bases:

Air India, Bombay; Services of India, Bombay; Air India, Calcutta; Bharat Airways, Calcutta; Deccan Airways, Hyderabad; Indian National Airways, New Delhi; Indian Overseas Airways, Bombay. An added source for December reports is National Airways, Dhaka, which makes route only in India previously and has more provincial government backing.

All the three licensed foreign services—Air India International to England, Indian Overseas to Australia, and Bharat to China—now have long franchises. The latter two have just gotten underway with Singapore, and Indian Overseas is waiting an additional Bombay South Africa route.

► **Slow Training Program**—The pressure for both pilots and technicians has not slackened a bit, meanwhile, and the government is developing its training program slowly. A job-training scheme has been worked out which will build prospective pilots' experience from the provincial level clubs into a central school at Allahabad where ultimately \$600,000 is to be spent on developing facilities.

Meanwhile, business must pay roughly

\$610 for a six-month preliminary flying club course. Then they proceed to the central school where they will be trained \$1500 for a 6.5 month advanced course. If they get through, \$734 is refunded. Training is again to take an only such later expansion as may be approved by the Civil Aviation Directorate and to enroll in the RIAF reserve.

The charges may not be much by foreign standards, but they represent some relatively beyond all but the well-to-do, which explains why anyone to the first aviation for applicants was to find that the deadline has been considerably extended.

► **Visas**—On the military side, the three Vangas purchased last autumn have been constant the only tangible evidence of progress. They have been purchasing the country to let be personnel become familiar with them in a general way, and staying on shows on the side.

At Marshall St. Thomas, Elmhurst, on last June Britain as RIAF chief, has revealed that he hopes to get some plans from British side, as much as a current "buying trip." Types sought have not been disclosed, and indications are that some jobs will be involved.

The U. S. is far from positive as goes with the RIAF, despite actually strong Commonwealth ties. That's the good side of the American side. Two RIAF officers seem to be in travel standards for advanced technical training. And an air attaché is to be posted at the Indian Embassy in Washington soon to develop connections.

Facilities Problem

TOKYO—The U. S. Air Force, now operating all ground facilities, wants to install superlatitudes in Korea and part of Japan.

What the air transport industry in the Far East wants to know: Who will get these facilities on a permanent operating basis?

The report involved—Korea, serving the region of the South Korean Republic and Japan, now CAA, Japan—seems considerable air transport support, now furnished by the Far East Air Force (FEAF).

► **NWA Could Expand**—Northwest Airlines, which serves Kanto since a week, probably could expand its schedule to provide necessary transport service. But operation of ground facilities, planning cannot be factored in (Aerobase News, May 3, 1948), is the big problem.

Logical solution would be for Civil Aviation Administration to take over, much the same as in the Philippines. There, working with the Philippine government, CAA brought in equipment, most native technicians to the U. S. for training; gave on though training in the island.

Similar undertaking would probably mean the Korean problem—but CAA doesn't have the experience to handle the job.

Alternate solution would be for NWA personnel to operate equipment which USAP could transfer to the Korean government. But NWA would only consider this job on an interim basis under contract with CAA and Korean government.

Here, strong important industrial zone of Korea (including cities of Osaka and Kobe) has not yet been used for commercial operations, but is principal alternate for Tokyo's Haneda Airport.

CAA's job is to determine how to keep lines available if USAP eventually withdraws. E. V. Petrie, of CAA's Tokyo office, has just left his Minneapolis and Chicago with these problems at the top of his agenda. Prospects are poor and without any time, but it should have been done months ago.

Lines Nationalized

BRUSSELS AIRBUS—The sale of pilot-own companies in Argentine domestic air transport has been called by government since nationalizing four international airlines.

The domestic operation of the lines will be subordinated to the Ministry of Transport. All present operators will be retained. It is believed that all four lines will be combined and centrally controlled.

The government disclosed that the lines had lost more than 45 million pesos in 1947 and that losses in 1948 were estimated at more 65 million pesos.

Greek Mission

A civil aviation mission to Greece, sponsored by ECA, and including 15 CAA specialists who will assist in establishing, maintaining, operating and improving Greek aviation facilities, is now en route to Greece.

Mission is headed by Kenneth Mendenhall, who has been superintendent of CAA survey operation branch.



NOW- Jet Power for Patrol Planes

The speedy Martin Mercator patrol plane rocks out its quiver over long distances. Flashes like a skilled boxer. Shuts down its slapper blows. Then lights out at top speed. Must choose aircraft of its kind over bank, this Navy patrol plane has lightning-fast maneuverability—with a high rate of roll—a high rate of climb—and a quick response to controls unusual for a plane of its size and carrying capacity.

Its 20 mm. cannons and other armaments make it a powerful offensive and defensive weapon. It has the cruising stamina to find its targets and return over long distances. Two reciprocating engines for economical long-range power—and two jets for extra bursts of speed—are uniquely teamed in two nacelles. The Martin P-38 Mercator is the first jet-powered patrol airplane—another first in a long line of great Martin planes that have strengthened our Navy's air arm. The Glenn L. Martin Company, Baltimore 5, Md.

Martin
AIRCRAFT

Builder of Dependable Aircraft Since 1919

SALES & SERVICE



Cessna Trades Fabric for Metal

Company adopts all-metal wing on two-place Model 140; claims better control and performance.

Cessna Airplane Co. last week took the last steps of fabricating its all-metal wing for its 1949 two-place Model 140.

Prototype on two versions of the all-metal 140 are \$3995 with 90 hp. Continental and \$3995 with 85 hp. Continental. The companion model 120 has been discontinued. (Last year's 140, with fabric-covered wing, was priced at \$3345 inclusive Welles.)

► **Control**—Wing is semi-cambered with high-efficiency taper and angle left stall. Larger airfoil area and increased flap efficiency are said to give improved control in flight and landing approach.

Cessna states the new wing gives the airplane a slight increase in performance, and claims a 116 mph cruising speed and a top speed of over 125 mph. Both claims are conservative, Welles observes again.

The new 140 wing, while similar in appearance to the all-metal wing used on the four-place Cessna model 170 this year, is not interchangeable.

Cessna engineers have changed the wing design for the all-metal in order to provide for greater stability and a better location of center of gravity than the interchangeable wing would give it. Cornett has more on airplane manufacturing methods along that line of the personal and business aircraft fields are now all the way over on the all-metal side of the fence.

The all-metal companies are so solid that in Cessna, Beech, Mooney, Luscombe and TEMCO. Both companies, Raytheon & Research is making metal fuselages. Raytheon with fabric-covered outer wingpanels. Seventh, Aerostar, is making metal winged four-place biplanes with fabric-covered tubing base legs, and is reported developing a metal fuselage two-place.

► **Stall**—Ladder—Piper recovers leading producers of fabric-covered aircraft. Other companies using fabric covering include Taylorcraft, Bonanza, Cessna, Aerostar and Luscombe, as noted above. Cessna engineers and sales representatives look to their new 140 to bring about at least a partial revival of the two-place market, lagging badly

ever since the 1940 period of instant obsolescence.

The 140 though is useful principally as an executive business and firm travel vehicle.

► **Equipment**—The 1949 model uses the highly successful patent standard spring steel landing gear Cessna introduced on its first postwar models. Other equipment includes hydraulic fuel boosters, full swinging struts, tricycle landing gear and instruments which are shock-mounted.

Fuel capacity of 35 gal. gives the plane a cruising range of 94 hr. Interior has been revised to give harmonizing color combinations and seats are designed for easy sitting on long cross country flights, the manufacturers report. Climbing is quickly attainable without disturbing propeller, giving new access to the entire cockpit and no access.

Delivered on the all-metal 140 will begin in June.

Bell Subsidiary

The recent formation of a wholly-owned subsidiary, Bell Aircraft Supply Corp., was announced by Bell Aircraft Corp., incorporated in California. The new company has been qualified to do business also in the states of Louisiana and Texas.

Officers are David G. Foreman, president, David F. Brown, secretary, and Harry Gussard, treasurer. All are officers of Bell Aircraft Corp.

Bell Aircraft Supply will handle the sale and lease of helicopters and parts on its West Coast and will serve on helicopter field operations, including oil services, in the two southern states. Arthur L. Parnell is manager of the southern division with headquarters at Bakersfield, Calif., and Joseph S. Brown is manager of the exclusive division, whose headquarters are at Lubbock, La.

R. I. Airports

More than 50 millions worth of airport construction work will be started in Rhode Island this year, according to Philip S. Vassallo, state director of public works.

One of the developments, on which \$1 million will be spent, will be a Class I field at Smithfield, south of Providence. This field will have a single strip, a taxiway and other buildings.

The main one of the first efforts by the Civil Aeronautics Administration to encourage construction of single-strip fields. CAA thinks now up they are promoting the idea with the hope of encouraging later adoption of crosswind landing gear by both military and private owners of airports.

Snap! it's on...
Snap! it's off...



It's SNAP-IT-TRIM handy attaching device for fabrics

There's an ingenious gadget for securing fabrics quickly and easily to any surface. SNAP-IT-TRIM consists of a metal clip strip, attached directly to the surface to be covered, and a plastic encasing. The covering material is stretched over the clip (no pre-punching necessary) and the enclosure is snapped on.

Monadnock also manufactures FABRI-LOC fabric encasement, Adams-Eco WEEDITS, AIRLOCK, 801-A-NUTS... has a wealth of experience in the framing field. We welcome inquiries from manufacturers seeking reliable equipment and production facilities.



exclusive of UNITED-CAR PATENTED CORP.

BRIEFING FOR DEALERS & DISTRIBUTORS

RETURN OF JACK— W. (Jack) Miller, a back home at Piper again as domestic sales manager, after what amounts to a year's leave of absence (in the interim he sold Ryan Nomads).

Jack started to sell Cubs back in 1932 as operator of the Lock Haven City Airport, while Piper was still in Reading, Pa. He has accumulated some 8000 hours as a pilot, mostly in Cubs, in his 22 years of flying. One of the best known airplane instructors in the business, Jack comes back to put additional fire into the sales effort for the little four-place Piper Clipper and rest of 1949 Piper line.

Clipper was best offer of 1949's airplanes and seems to be catching on rapidly with the airplane newcomers.

AERONCA SEDAN SPRAYER—Certification of new spray unit kit for the 145 hp. Aeronca Sedan makes that the first of the postwar biplanes to have standard sprayer version.

Kit will be available in field installation this season. It may be offered factory-installed as next year's Sedan. It was developed by Sordy-Sorenson Co., Worthington, Mass., manufacturer of the smaller unit used on 90 hp. Aeronca Spray Champ.

Dakota Aviation Co., Haiku, S. D., national distributor for Sordy-Sorenson, will handle all 1949 orders. Unit is priced at \$155 FOB Works, engine with additional installation costs estimated at \$40.

Sedan sprayer unit includes large single tank built on wing, attached directly behind the two front seats, placing it well within CG limits. Tank capacity is "over 80 gal." Tank may be filled from either side of airplane. Washdown gunner's gun with discharge fitting is attached to left landing gear strut.

Spray bar unit is located low enough not to be affected by streamer under wing, and provides a controlled spray swath of 45 to 60 ft. When tank is included, streamer panels, rear seat and rear floor board are removed, so weight with sprayer tank is only 52 lb. above normal weight empty of the sedan.

ABILITY TO FLY—Of the first 780 replies to Personal Aircraft Company's new survey on industrial and business uses of airplanes, approximately 95 percent report that ability to fly is considered a definite advantage in the mind of an employer.

The reply should provide additional ammunition to answering the non-answered Veterans Administration question that is.

Respondent W. J. Tardiff goes a little more into detail than some other persons polled, commenting: "The airplane is going to be one of the main factors to keep boys from leaving the farm."

WANTED: 600 PILOTS—Army units of the National Guard are looking for 600 qualified biplane pilots. Persons Ali Faxon, Gary and Maurice pilots and license AGF biplane pilots are invited to apply to Adjutant General's office in the state in which they live. Pilots accepted will be authorized to fly a maximum of 300 hr a year in biplane type planes with flight and base pay. Non-flying applicants must qualify through an eight-month biplane pilot training course at San Marcos, Tex., and Ft. Sill, Okla.

LOW PASSENGER MILE COSTS—Piper Aircraft has some interesting travel cost figures made up on the basis of the operational cost of the 550V5 Piper Clipper. The airplane has a 110 mph. conservative cruising speed at 6000 ft./hr. fuel consumption, which figures out to \$3.00 or less than half a cent a mile per occupant for direct fuel cost. Cost of less than two cents a passenger mile including depreciation, depreciation and maintenance is claimed when plane is operated 300 hours a year.

Admittedly the Clipper won't carry four people plus baggage for any great distance. But it could carry two people, so every in-family travel in a business airplane, and a considerable amount of baggage, for 400 miles, at 100 mph range. That would still be at the rate of less than 4 cents a mile apiece, comparable even to the car coach fare and considerably less than regular air fares.

—ALEXANDER MURPHY

PIPER-STINSON '49



The Most Thoroughly-proved Four-passenger Plane

By its best the Piper-Stinson 49 for comfort, all-around performance, styling and ease of flying. Here's a plane to rise to fly, so tough, so rugged that more people have bought Stinson since the war than any other 4-place aircraft.

No other plane in its class enjoys the advantage of improvements and refinements incorporated from the experience of more than five thousand previous models.

Step up to a Stinson—thoroughly proved by millions of hours of flight, carefully engineered for maximum all-around performance and sturdily constructed for low-cost maintenance.

There'll Always be a Stinson

24 years ago Stinson made personal airplane history by building the first biplane with a cabin fuselage and cabin. Ever since, Stinson has set the pace for quality, performance, and comfort.

Features of the Stinson have always included beautiful light cabin interiors, rugged reliable construction and beautiful styling.

Now Stinson has become part of Piper Aircraft and we're both proud and improved with our responsibility to uphold it. As you to serve the expansion that is Stinson. At its very heart, planes are being made for today, new Stinson models which will do just what you need in the expansion of business and will bring new meaning to personal and business aircraft alike.

Or simply as a gift to a friend.

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DC-9s. Late arrivals (aviation week, May 21, CAAI turned down the company's proposal to extend the service from Kansas City to New York.

► **South-Superior-Latest coach fare** likely to be augmented by CAAI are those of National Airlines, South Airways and Continental Air Lines. All were to have become effective May 15.

National wanted to use DC-6 "Night Star" flights between New York and Miami. Eastern Air Lines strongly protested, stating that the operation would adversely affect the results of special revenue traffic which both EAL and NAL are offering between May 15 and Oct. 31 to lift off-season traffic levels.

Eastern emphasized that it was not opposed to changing to more typical lanes designed to stimulate cargo transportation. It noted that readjusting one under the 30-day summer traffic rule can be less than the "Night Star" rates.

► **American, UAL, Pan-Am-Bureau** 1-hour flight "no coach service" between Dallas-Ft. Worth and Chicago was approved by both American Airlines and United Air Lines. UAL argued that there was little difference between Bureau's regular flights and the proposed coach service, although fares on the latter were to be 33 percent cheaper. The Bureau coach fare did not meet rights to late evening hours, and cargo

space and speed were the same as on non-coach services, UAL complained. United's Bureau coach route began approved. United would have been on an uncontested spot. A passenger could have flown from Chicago to Kansas City on Bureau's jetliner and from Kansas City to Los Angeles via TWA's discounters for a total of \$75.70. UAL's Chicago-Los Angeles fare is \$117.75. United could have been undercut similarly between Chicago and Denver by a combination of Bureau and Continental skycoach services.

Following another UAL protest, CAAI suspended Continental's tariff providing for a cut in its present 60-cent-a-mile Denver-Kansas City air coach rates to 3.1 cents a mile. Continental said it wanted to make its coach fare competitive with rail coach rates which are lower in the west.

Canadair Takes Ads To Defend Its Planes

Recent criticism of "North Star" and Canadair-Peet aircraft built by Canadair Ltd., Montreal, is being answered publicly by the manufacturer and Trans-Canada Air Lines.

In a "statement to the people of Canada" published in Dominion newspapers, Canadair took issue with assertions that its aircraft compare unfavorably with the Douglas DC-4, which they resemble. TCA President Gordon McGeorge also defended the performance of his company's 40-passenger North Stars, which are in use domestically and on routes to England and the British West Indies.

► **Licensed by Douglas-Boeing**, the Canadair aircraft are DC-4s with Rolls Royce Merlin engines, but they have more DC-6 features including powered engines. Douglas licensed Canadair to build airplanes and to sell the planes anywhere in the British Dominions.

Canadair has produced a number of C-540M North Stars for the Royal Canadian Air Force and 10 DC-6M North Stars for TCA. It is now making deliveries on 22 Canadair-Peet 40 British Overseas Airways Corp. TCA also has more DC-6Ms.

► **BOAC** carried on its voyage in England last summer when it could shed a V. Roe & Co's Tiger transport in favor of the Canadair British plane manufacturer being protected the move.

► **Latest Vespene-Canadair** is the latest version of the DC-6M type aircraft. It has more powerful engines (using Rolls Royce Merit-624 instead of DC-6M's Merit-620), higher gross weight and, reportedly, a slightly higher cruising speed.

Canadair Pacific Air Lines recently took delivery on the first of four Canadair-Peet it has on order. The 36-

passenger planes will be used for trans-Pacific operations.

► **Defects** But—inspections that the North Stars are comparable were made in the Canadian Parliament at Ottawa. TCA's growing defects on the trans-Atlantic run were also attacked during House of Commons committee meetings. Some members suggested action in London be discontinued. McGeorge replied that the Atlantic operation would show profits "in the balance of time."

Canadair and TCA's North Stars are being accepted considerably in excess of average daily aircraft utilization experienced by other airlines of the world. It added that Canadair planes have received "enthusiastic approval" of the chief pilots of almost every important international airline.

Canadair newspaper advertisements made the following comparison of performance data for the DC-4 and Canadair-Peet:

- **Engines**—DC-4, Pratt & Whitney Twin Wasp, 1400 hp.; Canadair-Peet, Rolls Royce Merlin, 1700 hp.
- **Maximum Cruise Speed**—High Northstar certified altitude with maximum cruise power—DC-4, 245 mph at 21,000 ft.; Canadair-Peet, 325 mph at 32,000 ft.
- **Maximum Payload**—DC-4, 13,046 lb.; Canadair-Peet, 17,498 lb.
- **Maximum Rate of Climb**—at 28,000 ft.—DC-4, 250 fpm at 21,000 ft.; Canadair-Peet, 500 fpm at 32,000 ft.
- **Service Ceiling**—DC-4, 22,500 ft. at 71,000 lb.; Canadair-Peet, 35,300 ft. at 62,000 lb.
- **Maximum Landing Weight**—DC-4, 61,500 lb.; Canadair-Peet, 70,000 lb.
- **Maximum Zero Fuel Weight**—DC-4, 55,000 lb.; Canadair-Peet, 65,800 lb.

Work Continues On NWA 2-0-2s

Part of the Northwest Airlines May 20-21 test that has been in Glass L. Martin Co.'s Baltimore plant for re-evaluation of wing spar structure and other improvements is ready to go back in service.

Seven new planes from NWA's fleet of 2-0-2s were last being worked on at the Martin plant, the most and groups of six to eight Northwest 2-0-2s will be out of service between now and October. Modifications test aircraft between six and eight weeks per plane.

► **Inspection** The latest modifications will permit elimination of all CAAI-approved short-term inspection of the wing structure. This was required following the crash of a 2-0-2 last August. New work also will make the 2-0-2 wing completely interchangeable for the first time since they were first introduced last fall.

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EDITORIAL

Public Opinion Is The Spark

The one question we are being asked most by people outside aviation is, "Why is the government clamping down on the non-scheduled airlines?"

It appears obvious that the non-scheduled have been more successful than the scheduled carrier in getting their side of the controversy over to the public.

When you inform your questioner that the government's aviation economic agency controls the schedule, he is violating the law, he is puzzled. Then he asks the next question.

If the Civil Aeronautics Board thinks they are operating illegally, why has it allowed them to keep operating into May, 1949?

That is a good question. We wish someone at CAB would answer it. Finally, we believe it is because they realized some of the non-scheduled have been performing a public service. Otherwise, why would so many of the public be phoning down their hard-earned dollar to treat that way?

We also believe—although no one in the Commerce Building would admit it—that CAB has been sitting back watching the barometer of public opinion, waiting to see how much outside pressure would build up pro and con.

Although you don't read much about this point in textbooks on ethics and government, outside pressure on an agency—such as the White House, Congress or press opinion, are so often more powerful influences than the ideas within the government agency itself, where the decision eventually are made.

Now frequently as outside influence from the White House, or a few members of Congress, or the Demo-

cratic National Committee, is not a true reflection of public opinion. But if it is obviously the strongest influence at the moment, it may swing a decision.

Once the decision is agreed upon, it must be packaged with the proper legal justifications. These legal cotton-thetics, both in pending actions and in accompanying decisions, are usually the means to an end, seldom the springboard of action. It is regrettable that so many top industry executives permit themselves to get lost in the maze of the law instead of keeping to the long view.

Because whether we like to admit it or not, material outside forces at the moment can be as influential on Government administrative or quasi-judicial agencies as they are on business and industry. If these influences accurately express public opinion, they will eventually win out. If they do not accurately express the people's desire they will be overruled eventually. Because public opinion is the dominant force in America.

That means industry public relations is a vital force when it is rightly conducted. But an industry public relations policy must be based on honesty, and on facts, and it may be a terribly destructive boomerang. The American public is inherently honest and sound but it must be fed with truth before it can exhibit its great common sense. The more facts it is given, the more intelligent will be its decisions.

That is why we urge a coordinated press relations or information program for the airline industry. If others give more facts to the public, and present them quickly, the airlines can hardly expect the kind of public response the airlines feel they deserve. So far, the non-scheduled have done a better public relations job than the old-line industry's own trade association. It is because they have given the public more facts.

ROBERT H. WOOD

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Tommy was in on the design and production of the first turbojet engine in the United States—the General Electric IA. Tommy worked with England's Whittle, Air Force officers, airframe manufacturers, and expert design men like Sam Puffer and D. F. "Truly" Warner. He supervised the installation of the historic IA engine and saw it grow from a plan to a practical, powerful reality.

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